

Changing Military Responsibilities and Relationships

During World War II, the Office of the Chief of Engineers and its subordinate activities exercised a broad range of military responsibilities. The Corps trained engineer officers and enlisted men, primarily at Fort Belvoir, Virginia, home of the Army's Engineer School since 1919, and at Fort Leonard Wood, Missouri, where an Engineer Replacement Training Center opened in 1941. It developed the tables of organization and equipment that structured Army engineer units, wrote the technical manuals that explained the use of engineer equipment, and prepared the field manuals that detailed military engineering tactics and doctrine. The Corps of Engineers determined the Army's engineer equipment requirements, purchased the items needed, and distributed them, while supervising the efforts of the Engineer Board to develop new and improved equipment. It selected engineer officers for assignment to troop units, schools, and civil works. The Corps supervised all Army map making. Finally, it met the huge military construction and real estate needs of a rapidly expanding Army.

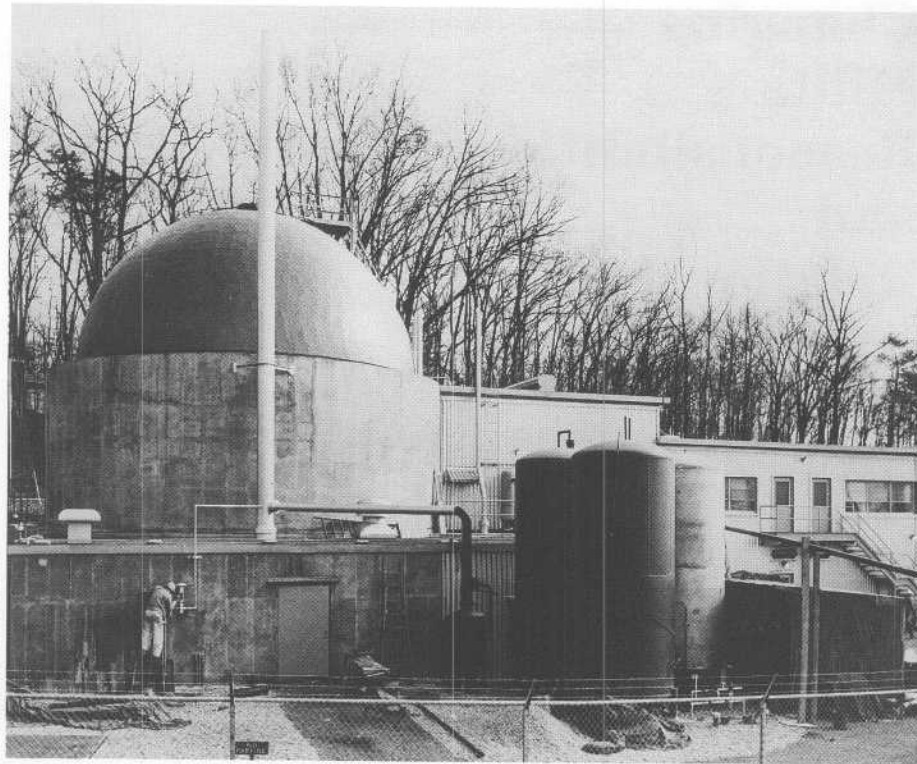
These functions, with the exception of general military construction and Army real estate, were traditional Corps missions that the Corps pursued during the war in vastly expanded form. Three months after the attack on Pearl Harbor, however, its position within the War Department changed as the Corps and other Army technical and administrative services were placed under the Services of Supply, one of three major components into which the War Department was then divided. General Brehon Somervell, himself an engineer officer, commanded

this organization throughout the war, although its title changed in 1943 to Army Service Forces.

When the Army Service Forces headquarters was dissolved in 1946, the Chief of Engineers and the chiefs of the Army's other technical services returned briefly to the direct supervision of the Army Chief of Staff. The Director of Logistics, however, inherited the general supervision of the technical services in 1948, and the Deputy Chief of Staff for Logistics obtained more effective oversight of their work in 1954. The Under Secretary of the Army (during 1950-1953) and Assistant Secretaries of the Army for Materiel; Financial Management; Civil-Military Affairs; and Manpower, Personnel, and Reserve Forces (during the Eisenhower administration) successively provided civilian direction for the Corps' military construction, housing, and real property functions.

For a decade and a half after World War II, the Army Corps of Engineers undertook the same broad range of functions it had exercised during the war. It even retained its role as engineering and construction agent for the U.S. Air Force after that service became independent of the Army in 1947. In 1954 the Corps became responsible for the Army's nuclear reactor program. It created the Army Engineer Reactors Group, which in 1957 completed, in conjunction with the Atomic Energy Commission, the nation's first military nuclear power plant built primarily to generate electricity. Other nuclear plants followed, including a floating power plant and field reactors producing both steam heat and electricity.

A sand grid confinement system designed by the Waterways Experiment Station to construct solid military roads across beach or desert sands.



Enriched uranium nuclear power reactor erected at Fort Belvoir, Virginia, in 1955-1957 by the Army Engineer Reactors Group and the Atomic Energy Commission. The Army's first nuclear power reactor, this facility was decommissioned in 1973.

Research Laboratories

The Corps' laboratories prospered in the postwar years.

The Engineer Research and Development Laboratories at Fort Belvoir, successor to the Engineer Board, continued its work in developing new and improved bridging, road-construction, camouflage, demolition, mapping, and mechanical equipment. A Nuclear Power Branch was added to the laboratory to engage in research and development in the nuclear power field.

The Waterways Experiment Station, established by the Corps and its Mississippi River Commission in 1929 at Vicksburg, Mississippi, as a hydraulics laboratory, had entered the field of military research and development during World War II. It then helped to develop the pierced-steel plank and prefabricated bituminous surface used in U.S. Army airfield construction. Placed under the direct supervision of the Chief of Engineers in 1949, the Waterways Experiment Station after the war developed flexible pavements for runways designed for new, heavy B-52 bombers, and it examined, through chemical simulation, the blast effects of nuclear detonations in an effort to produce hardened struc-



Waterways Experiment Station

The Waterways Experiment Station around 1940, shortly before World War II refocused much of the laboratory's attention on military requirements.



Waterways Experiment Station

Part of the one-mile sand grid demonstration road constructed at a Joint Logistics over-the-shore test at Fort Story, Virginia.



Cold Regions Research and Engineering Laboratory

The Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

tures capable of withstanding such attack.

Responding to increased Army emphasis on Arctic defenses, the Corps of Engineers during and after the war established laboratories at Wilmette, Illinois, and Boston, Massachusetts, to study the impact of cold climates on military operations. These Corps laboratories conducted research and experimentation on materials and techniques suitable for construction in areas of snow, ice, and permafrost. Their efforts aided the development of the Distant Early Warning (DEW) Line Radar System in Greenland, northern Canada, and Alaska and of American airfields and bases in that region. The laboratories consolidated in 1961 to form the Cold Regions Research and Engineering Laboratory at Hanover, New Hampshire.

Reorganized Army

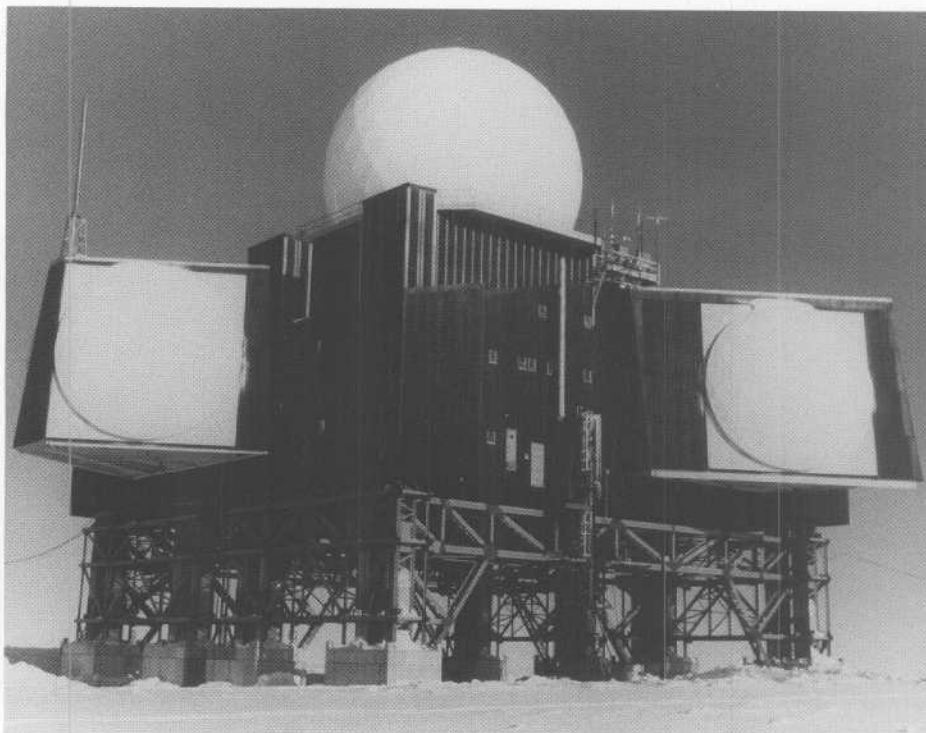
Seeking to streamline the Army's structure, Secretary of Defense Robert McNamara in 1962 implemented the most substantial reorganization of the Army in the post-World War II era. All of the Army's technical service chiefs, except for the Chief of Engineers and the Surgeon General, were eliminated, and three newly created functional commands took important responsibilities from the Chief of Engineers. The Army Combat Developments Command assumed responsibility for engineer training and military doctrine. The Office of Personnel Operations took over the career management of engineer officers. The Army Materiel Command assumed engineer supply and equipment development functions.

Overseeing the development, purchase, and supply of a wide range of Army weapons and equipment, the Army Materiel Command created a number of

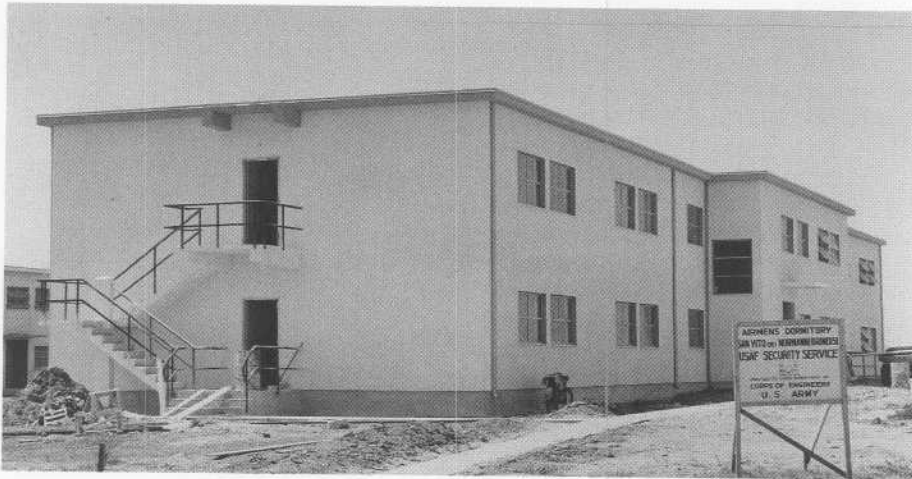
major subordinate commands to which it assigned responsibility for specific types of items. The Army Mobility Command (1962-1967) and its successor, the Army Mobility Equipment Command, took over the supply of most military engineering equipment and the supervision of the Engineering Research and Development Laboratories at Fort Belvoir, which became the Army Mobility Equipment Research and Development Center. The two commanders of the Army Mobility Command, Major Generals Alden Sibley and William Lapsley, were both engineer officers, and Sibley moved to the Mobility Command directly from his duties as the last Deputy Chief of Engineers for Military Operations. This eased the transition in engineer supply matters.

Major General William Gribble, later Chief of Engineers, served as

Cold Regions Research and Engineering Laboratory



A Distant Early Warning Line station on the Greenland ice cap.



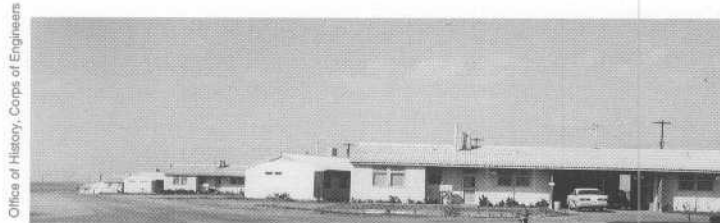
Dormitory built in 1965 for U.S. Air Force personnel at San Vito dei Normanni in southern Italy.



Construction in early 1989 on the Army Engineer School, Fort Leonard Wood, Missouri, under the direction of the U.S. Army Engineer District, Kansas City.

the Army Materiel Command's Director of Research and Development in 1964-1966, and Major General Richard Free, another engineer officer, held that position from 1967-1969. These were important years for the development of new engineer materiel used to support American forces in Vietnam. Aided by renewed experimentation in airfield mats and membranes at the Waterways Experiment Station, the Materiel Command developed the prefabricated, neoprene-coated nylon membrane known as the T-17 membrane, used on airfields in Vietnam; new aluminum and steel landing mats; and penepreme, a high penetration asphalt that met dust-control needs in Vietnam. The Chief of Engineers remained the senior engineer adviser to the Army Chief of Staff, and his advice was sought and implemented on such decisions as the selection of the D-7 dozer as the standard bulldozer in Vietnam, in preference to the newer but less easily transported D-8 model.

Despite its loss of important training, personnel, and materiel supply responsibilities in 1962, the Office of the Chief of Engineers continued to supervise the engineering, construction, and real estate services required by the Army, Air Force, and National Aeronautics and Space Administration. The Chief's office also continued to formulate Army policies governing the maintenance and repair of Army housing and other real property and the operation of the utilities on Army installations, as it had since World War II. Army facilities



Houses constructed at Ben Guerir, Morocco.

engineers implemented these policies under the supervision of installation commanders. The Chief of Engineers, however, lost control of funding in the repairs and utilities sphere in 1958. The Chief of Engineers' work in all of these fields remained under the general staff supervision of the Deputy Chief of Staff for Logistics, while the Assistant Secretary of the Army for Installations and Logistics in 1961 assumed civilian oversight of all of these functions.

In addition, the Office of the Chief of Engineers continued to supervise Army mapping, geodesy, and military geographic intelligence services, maintaining the Defense Department's worldwide map library as it had since 1939. Beginning in 1963 and 1964, it exercised its topographic responsibilities under the program direction of the Assistant Secretary of the Army for Research and Development and the Army Staff direction of the Assistant Chief of Staff for Intelligence.

While the Engineer Research and Development Laboratories was placed under the Army Materiel Command in 1962, its former topographic and nuclear power development functions remained Corps of Engineers responsibilities. With the field of military mapping research expanding rapidly at the dawn of the satellite era, the Chief of Engineers in 1960 had transferred this function from the Engineer Research and Development Laboratories to the newly created Engineer Geodesy, Intelligence, and Mapping Research and Development Agency. The reorganization of 1962 left that agency part of the Corps of Engineers. The agency was renamed the Engineer Topographic Laboratories in 1967.

The Defense Department consolidated the topographic work of the different military services in 1972, however, and the U.S. Army

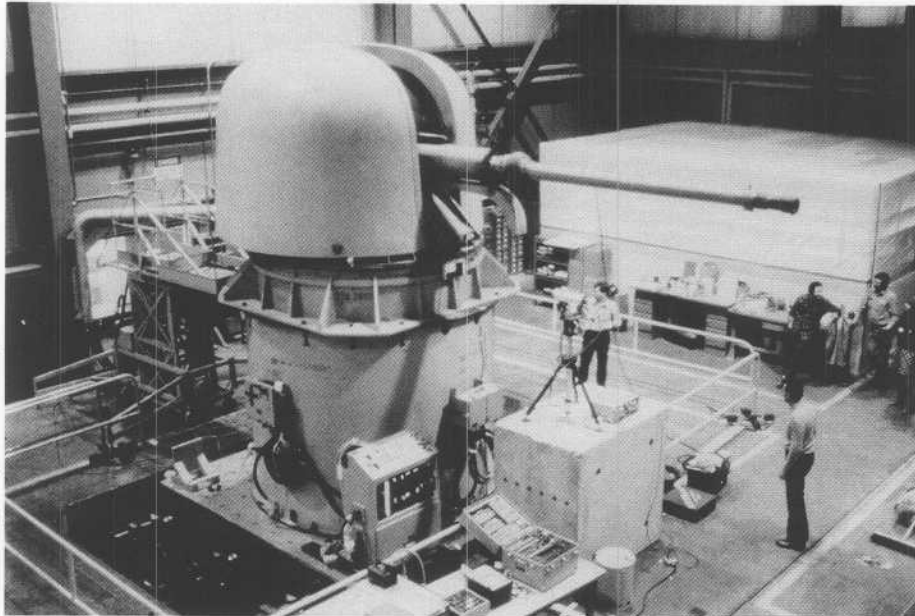
Topographic Command, whose director had reported to the Chief of Engineers, was absorbed into the new Defense Mapping Agency. The Chief of Engineers again retained responsibility for Army topographic research and development. The Engineer Topographic Laboratories, located at Fort Belvoir, Virginia, developed during the 1960s and 1970s automated equipment for producing topographic maps from aerial photographs and improved systems of Army field map production. In the 1980s they developed systems to convert terrain data into digital form and used computer graphics to offer Army commanders access to this data in a variety of easily interpreted formats. The Corps renamed the topographic laboratories as the Topographic Engineering Center in 1991.

The Army Engineer Reactors Group, renamed in 1971 the Army Engineer Power Group, retained the Corps' responsibility for Army nuclear power development after the 1962 reorganization. In May 1962 the Corps created the Army Engineer Nuclear Cratering Group at Livermore, California, to study, in cooperation with the Atomic Energy Commission, the feasibility of nuclear methods of excavation. Although officials considered using nuclear devices in the construction of a proposed sea-level canal across Central America and in several civil works projects in the United States, no feasible occasion was found to employ this concept. The Corps disbanded the Nuclear Cratering Group in 1971.

The Cold Regions Research and Engineering Laboratory was transferred to the Army Materiel Command in 1962, but because of continuing Corps of Engineers requirements for arctic construction research, the Materiel Command approved its return to the Corps of Engineers in 1969.



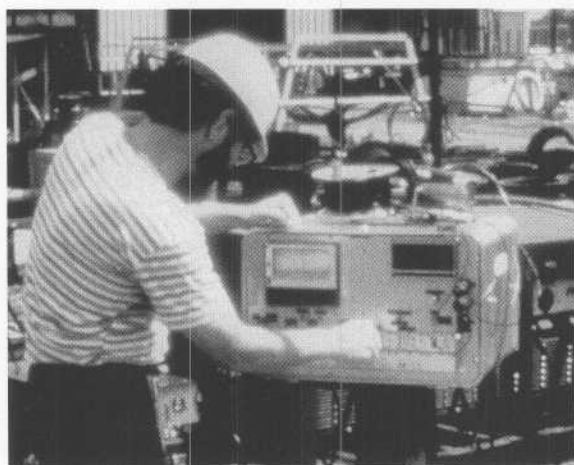
The autonomous land vehicle, a test robotic vehicle developed by the U.S. Army Engineer Topographic Laboratories.



Biaxial shock test machine designed by the U.S. Army Construction Engineering Research Laboratory to test both horizontal and vertical structural strength.

After the transfer of the Engineer Research and Development Laboratories to the Army Materiel Command, the Chief of Engineers sought the creation of a new facility to conduct basic research into questions of construction materials and design, housing habitability and maintenance, and energy and utility systems. As the Ohio River Division's Construction Engineering Laboratory at Cincinnati had begun significant work in this sphere, the Corps with the approval of the Army secretariat expanded that facility into a new Construction Engineering Research Laboratory. The new laboratory opened at Cincinnati in 1968 and moved the following year to its present location at Champaign, Illinois, where it occupied facilities leased from the University of Illinois. This newest Corps laboratory developed a fibrous reinforced concrete used both in airfield runways and in some civil works projects, a portable instrument to test welding quality, and a centralized facility to control pollutants where Army vehicles are washed.

A portable weld quality monitor developed for field quality assurance by the U.S. Army Construction Engineering Research Laboratory.



Construction Engineering Research Laboratory

Engineer Troop Units

After World War II, Army engineer troops were organized primarily into engineer combat and construction battalions, supplemented by topographic battalions and various specialized engineer companies. The combat battalions



Centralized wash facility for Army equipment developed by the U.S. Army Construction Engineering Research Laboratory.

were designed to provide the engineering capabilities required by frontline forces, and their men were trained and equipped to fight as infantry if necessary. Engineer construction battalions had heavier equipment suited for the more permanent construction typically required to the rear of combat zones, and its members were not expected to fight as infantry. Lieutenant General Walter Wilson, the Chief of Engineers, proposed in 1962 to eliminate the engineer construction battalion and create a single, standardized engineer combat battalion that could be aided, when required for heavier work, by a construction equipment company. The Combat Developments Command studied Wilson's proposal but concluded that the construction battalion would be essential in the event of a lengthy war. Subsequent events in Vietnam supported this conclusion, for engineer construction battalions there played a leading role in the construction of Army installations and an ambitious highway development program.

The Chief of Engineers regained Army Staff responsibility for the development of Army engineer units in 1969, and a reevaluation of the proper role of the engineer construction battalion soon ensued. The Engineer Strategic Studies Group, a broadly chartered studies and analysis activity reporting to the Chief of Engineers, proposed in 1974 that the engineer construction battalion be reorganized and its firepower augmented so that it, too, would be prepared to assume a full combat role. In the contemporary climate of congressional concern over the military's proportion

of combat and support forces, frequently termed the "tooth-to-tail ratio," the Army then accepted this proposal, and engineer construction battalions at home and abroad were reorganized in 1975 as engineer combat (heavy) battalions. As part of the reorganization, the units were provided additional antitank weapons, grenade launchers, radios, and demolition equipment, and their men were given additional combat training. The conversion of the engineer construction battalions in Europe contributed significantly to the reduction of the Army's support forces there mandated by the Defense Appropriation Authorization Act for 1975. In that same year, the Army again included the Corps of Engineers among the Army's combat arms branches, while retaining it among its combat support arms and its services.

Army Facilities Programs

The Corps substantially increased its responsibility over the Army's military construction and family housing programs in 1974. Prior to that time the Deputy Chief of Staff for Logistics formulated Army budget planning and set basic policies for these facilities programs, which the Corps then executed. The Deputy Chief of Staff for Logistics exercised these functions through his Director of Installations, as he and his predecessors had done since 1954. As part of a larger transfer of Army Staff responsibilities to operating elements, the Army in 1974 placed the Director of Installations, Major General Kenneth Cooper, together with his staff and his



Cast iron building at Watervliet Arsenal, New York, erected in 1859 by Architectural Iron Works of New York. Today, it houses an Army museum. Named a National Historic Landmark by the Secretary of the Interior, it is the only totally iron building that survives in the United States.

program development responsibilities, under the Chief of Engineers. General Cooper became Assistant Chief of Engineers. In the same year the Corps added facilities engineering technical assistance and fossil-fuel energy consulting to the then dwindling Army nuclear power responsibilities of the Army Engineer Power Group, and it renamed this very changed group the Facilities Engineering Support Agency.

Environmental Responsibilities

The Army Chief of Staff in 1966 assigned the Chief of Engineers supervision over the engineering aspects of the Army's emerging program to protect the environment and abate pollution in the construction and operation of its military facilities. He instructed the Surgeon General and the Chief of Engineers to work together to develop Army pollution abatement programs. In 1971 the Deputy Chief of Staff for Logistics assumed primary Army Staff responsibility for directing the Army's environmental preservation and improvement activities, exclusive of the civil works arena. His Director of Installations created an Environmental Office in that year to undertake this responsibility. The Chief of Engineers continued to supervise the engineering portion of the program.

When the Director of Installations became the Assistant Chief of Engineers in 1974, the Corps of Engineers added the direction of Army environmental efforts related to military sites to those involving civil works projects. This mission came to include supervising the Army's water pollution abatement and solid waste management programs, issuing policies for monitoring and controlling air pollutants emitted by Army facilities and

Office of History, Corps of Engineers



The century-old Officers Club at Fort Totten, New York, a structure listed on the National Register of Historic Places.



A bulldozer removing contaminated soil at Rocky Mountain Arsenal, Colorado, a former chemical weapons production facility located ten miles northeast of Denver.

vehicles, and drafting regulations to govern the Army's management of hazardous and toxic materials, its noise abatement efforts, and its responses to any Army-caused oil spills. The Corps also assumed responsibility in 1974 for an Army program to preserve buildings of historic or architectural significance and noteworthy archaeological sites on Army properties. The Office of the Assistant Secretary of the Army for Civil Works assumed civilian direction of the Army's military environmental program upon the office's establishment in 1975. The Army shifted this oversight function to the office of the assistant secretary of the Army responsible for installations and logistics in 1978.

The creation of the Defense Environmental Restoration Program, first funded by a 1983 act, has led to a noteworthy enlargement of the Corps' environmental work relating to military installations. The three services had earlier initiated efforts to remove hazardous materials from their active installations. The new program added hazardous waste disposal from former military sites and the removal of unsafe buildings, ordnance, and other debris from both active and former military sites. The Corps of Engineers, which had already begun providing engineering assistance to the Environmental Protection Agency in its direction of civilian toxic waste removal under the Superfund program enacted in 1980, assumed program management in 1984 of the environmental restoration program for all former military sites, irrespective of service. The Deputy for Environmental Policy in the Office of the Deputy Assistant Secretary of Defense for Installations selected sites for cleanup, after considering the recommendations of the Office of the Chief of Engineers. The defense official's

position was raised to Deputy Assistant Secretary of Defense, Environment, in 1986. The U.S. Army Toxic and Hazardous Materials Agency, created in 1978 at Aberdeen, Maryland, as a subordinate activity of the Army Materiel Command, maintained operational control of the expanded environmental restoration program on active Army installations, but it too relied on the Corps of Engineers for most of its design and construction work. The Corps has provided similar assistance in the cleanup of many active Air Force installations. In 1988 the Army placed the Toxic and Hazardous Materials Agency under the Chief of Engineers, consolidating Army environmental responsibilities under a single head.

Army Facilities Maintenance

The Corps of Engineers increased its involvement in maintaining and repairing Army housing and other facilities at the same time as it broadened its environmental responsibilities. A study panel headed by Engineer Lieutenant General Lawrence Lincoln in



Twin Cities Army Ammunition Plant

The award-winning volatilization system that in one year removed more than 100,000 pounds of dangerous organic compounds, such as the degreasing agent trichloroethylene, which contaminated groundwater around the Twin Cities Army Ammunition Plant, Minnesota.

1968 urged the Army to encourage installation facilities engineers to turn to Corps of Engineers districts and divisions for engineering support by funding a portion of that work. The Army agreed to set aside a modest fund for Corps installation support, invited commanders to turn to the Corps for additional maintenance and repair work on a reimbursable basis, and took other actions recommended by the Lincoln panel to strengthen facilities engineering.

When the administration of President Jimmy Carter proposed management consolidation and increased reliance on private-sector contracting in the maintenance of Army facilities, the Corps of Engineers undertook several new studies in this sphere. A panel headed by Brigadier General Donald Weinert reviewed Army facilities engineering in the context of the era's heightened emphasis on master planning, energy conservation, worker safety, and environmental protection. The group observed in 1978 that the Corps' resources were still often neglected in the facilities maintenance sphere, despite the Army's implementation of most of the Lincoln panel's recommendations. A subsequent engineer planning group headed by Colonel Charles Blalock proposed incorporating installation facilities engineers into the Corps' district organization, aiding them with the Corps' substantial experience in contracting and giving them a full range of local engineering responsibilities. Although the Army did not accept the offer of Lieutenant General John W. Morris, Chief of Engineers, to assume such broad installation engineering responsibilities, it did approve the plan, elaborated by the Engineer Studies Center (formerly the Engineer Strategic Studies Group), to centralize Army facilities maintenance work

in the Military District of Washington under a single engineer manager. The Corps of Engineers in 1980 created the Engineer Activity, Capital Area, at Fort Myer, Virginia, to exercise that function.

While installation commanders retained responsibility for maintenance work on Army posts, their facilities engineers turned increasingly to Corps districts and divisions for assistance in prosecuting the Reagan administration's substantial effort to reduce the backlog of Army repair and maintenance work. Streamlining its procedures in this sphere, the Corps of the Engineers saw its reimbursable instal-

lation support work grow from \$130 million in 1980 to \$620 million in 1986. Effective Corps support in this sphere was enhanced by new administrative reforms proposed by internal reviews made in 1985 and 1988, the former by a panel headed by North Central Division Engineer Brigadier General Jerome Hilmes and the latter by the Office of the Engineer Inspector General, Colonel Dennis Bulger.

A Major Command

Witnessing a decline in support for large, new water resources projects in the late 1970s, Chief of

Contract workmen install utilities in new Army Engineer School, Fort Leonard Wood, Missouri.



Missouri River Division

Engineers Morris attempted to strengthen his office's ties to the Army as a whole. This effort led to the designation in 1979 of the Corps of Engineers—comprising the Office of the Chief of Engineers, together with the divisions, districts, laboratories, and other agencies subordinate to the Chief of Engineers—as an Army major command. This status gave the Corps a position comparable to other leading specialized Army commands, including the Training and Doctrine Command, Materiel Command, Communications Command and Health Services Command and the Army components of unified geographic commands, such as U.S. Army, Europe. The Chief of Engineers' ties to the Army were strengthened further in 1986 when he was named Chief of the Corps of Engineers Regiment, a ceremonial institution through which all engineer soldiers, officers and units would participate in the new U.S. Army Regimental System. The Chief of Engineers' assumption of this position gave symbolic recognition to his office's long history of leadership among the Army's military engineers.

The Goldwater-Nichols Department of Defense Reorganization Act of 1986 obliged the Army to distinguish clearly between the small group of personnel who continued to serve the Chief of Engineers in his capacity as an Army Staff officer, who advised the Chief of Staff, and the larger number who worked for him as commander of the U.S. Army Corps of Engineers, the engineering and construction organiza-

tion. The act also mandated personnel reductions that had an impact on the Office of the Chief of Engineers as an Army Staff office. Responding to both the Army Staff personnel limitations and his own view of current management requirements, the Chief of Engineers, Lieutenant General E. R. Heiberg III, ordered the consolidation into a new Corps of Engineers organization of the Facilities Engineering Support Agency and the technical support activities of the Assistant Chief of Engineers in the fields of facilities engineering and housing management. The new organization, called the U.S. Army Engineering and Housing Support Center, was established in 1987 at Fort Belvoir, Virginia. Its creation left Army program development responsibilities in the facilities and housing spheres in a leaner Office of the Assistant Chief of Engineers, now distinctly an Army Staff organization. The Army Environmental Office became an Army Staff support agency, which also reported to the Assistant Chief of Engineers. The new Engineering and Housing Support Center assumed responsibility for providing engineering support and technical policy interpretation in the facilities and housing spheres to Army forces worldwide.

As the Army turned more of its attention to its domestic installations in the aftermath of the Cold War, Acting Secretary of the Army John Shannon in 1993 gave broad authority over planning, programming, and general support for Army bases, facilities, and environmental restoration efforts to a new

Assistant Chief of Staff for Installations Management. This new Army Staff officer assumed most of the responsibilities of the Assistant Chief of Engineers, whose office was abolished. The Army Environmental Office; the Army Environmental Center, as the U.S. Army Toxic and Hazardous Materials Agency had been renamed; and elements of the Engineering and Housing Support Center involved in policy were also placed under the new assistant chief of staff. General officers who had previously reported to the Chief of Engineers became the first Directors of Environmental Programs and of Facilities and Housing for the Assistant Chief of Staff for Installations Management. The military engineering and topography functions that had been overseen by the Assistant Chief of Engineers, however, remained Army Staff responsibilities of the Chief of Engineers. They were henceforth exercised by the newly established Office of the Chief of Engineers (Pentagon). The Engineering and Housing Support Center was renamed the U.S. Army Center for Public Works. Remaining under the Chief of Engineers, it has continued to provide technical support to installation commanders. Overall, the Corps of Engineers retained its design and construction missions, including the execution of a large and expanding program for the cleanup of hazardous materials at current Army and Air Force installations and former defense sites.